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Examiner	
Title of Invention	Rear projection screen.

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Abstract

Content none.

Representative Drawing(s)

Fig. 1

Description

[Title of invention]

Rear projection screen.

[The simple description of the drawing]

Figure 1 is a schematic plane view showing the rear projection screen in which 3 overhead projectors and light are projected from the overhead projector.

Figure 2 is a horizontal side view of the rear projection screen.

Figure 3 is a partial enlarged view of Figure 2 showing the first preferred embodiment of the present invention.

Figure 4 is a drawing which is similar to Figure 3 showing the reflection of the green beam and blue beam and refraction.

Figure 5 is a drawing which is similar to Figure 3 showing the second preferred embodiment of the present invention.

Figure 6 is a drawing showing the state passing through the rear projection screen of the light is the present invention.

A seventh, is an eighth, And figure 9 is a drawing showing 3 dissimilar embodiments of the respective present invention.

[The detailed description of an invention]

The present invention relates to the rear projection screen which is the thing about the transparent rear projection screen, and has the lens group which parallelly has the light from the overhead projector on the front side of the screen more concretely, facing the overhead projector, and has the lens group made with convex lens positioned between the lens of the conves photometric section of the shape of a mountain lens having the triangle section which is arranged in the front side of a screen as the horizontal direction having an interval COMMMA of a perpendicularity and these shape of a mountains. Of a form.

In the apparatus for image projection, the microfilm scanning apparatus, and the modulus radar in data equipment and flight, the rear projection screen is extensively used. A thing in US4,509,822 A specification which is the rear projection screen of this kind, and 1985 year April 9 is issued are known.

The overhead projector of 3 of three primary colors (the red, the green, and the blue) are used. It faces at the screen throwing the light. It is a bulletin to obtain the television picture.

3 overhead projectors is adjacent to the horizontal direction and generally it is arranged. The overhead projector of 3 theses is adjacent and it is arranged. Therefore, the optical axis of the light emitted is comprised an angle from these. According to a distance to the screen penetrating the light from and overhead projector of the overhead projector, an ordinarily, and these optical axises are comprised the angle of 7°~12°.

The designer of the most of projection televisions arranges the overhead projector of the green

between the overhead projector of the blue and red. The optical axis abeam the image of the green about the screen penetrating the light. Therefore, the optical axis of the red or the blue overhead projector is inclined about the optical axis of the green projector with for example, 9°.

As to the overhead projector television, the flat type anti-glare screen is used. And in case moreover, a viewer looks at a screen as the oblique direction, therefore the viewer sees the Premier in which the blue or the red is superior whether it is near to the optical axis approval of the red producing the image of the red, and the which side of that of the blue. This problem is called as the color shadow (colour shadow).

In the conventional technology, the conves photometric section posted at the front side of the rear projection screen is designed in order to do with an all-refractive. That is, while it is comprised the right angle about the total surface of *** after consisting of a photosilver from the overhead projector, and a parallel, it is income in the side of the conves forwarding part. It is the oyster dropping and and, a peak and side of the conves photometric section are penetrated. The in the conventional technology, to cancel the problem of the color shadow thing like this is difficult.

The prior art had the improvement of the color shadow as a purpose. However, the effect was not adequate. As to the rear projection screen of the prior art, a part of the source of Light of the rust which is perpendicularly,plumb incident in the screen plane is emitted from the direction which is faced it is total-reflected by the total reflection surface of 2 of the lens having the triangle section. Therefore, the luminance characteristic of the source of Light of the rust is symmetrically in the axis of the observation angle drawing 0° to the viewing angle except 0° with the outlier of 2. And the luminance characteristic showed the outlier of 2 about an enemy, and the source of Light of the blue clothes both sides identically with the source of Light of the rust. however, it corresponded to the displacement of the incident angle of the source of Light caused by the high position of the arrangement angle of the light source and it was shifted and this showed up. Therefore, the luminance of each colour changed according to the viewing angle. If a screen was observed from the different angle, the color shadow was generated.

The object of the present invention has to resolve the problem of the color shadow generated around the viewer looking about the normal of a screen within the horizontal range of about ±30° in that is, the cis acting in range of the convex lens.

According to the present invention, the purpose described in the above is achieved by the rear projection screen of the optical permeability excreting the means diffusing the light to each side of the conves photometric section.

The means diffusing this light decides on the surface of the lens side to the irregular surface. But the means diffusing this light does to an anti-glare. But by performing the coating which the means diffusing this light does with an anti-reflective it can obtain.

Next, referring to the figure, it circumstantially illustrates for the embodiment of the present invention.

In Figure 1, is schematically illustrated with 3 overhead projectors (1,2,3) that the television picture is projected into the backplane of the rear projection screen (4). The overhead projector of 3 theses project the respective green, and the red and blue. The overhead projector of 3 these are horizontally adjacent. The overhead projector (2) of the center which is the overhead projector of the green the optical axis is mostly perpendicularly,plumb arranged about the screen (4) as as possible. The screen (4) is comprised of the Fresnel lens (Fresnel lens) (4a) appointing the light from overhead projectors (1,2,3) as a parallel and the lens (4b) refracting the collimated light.

The optical axis of overhead projectors (1,3) are mostly comprised the optical axis of the overhead projector (2) and angle of 6°~10°. It is possible that using lenses (5,6,7) adhered to the front side, 3 overhead projectors (1,2,3) lights the expanded which is in proportion to the overhead projector on the screen (4).

According to the prior art, it closes to the viewer positioned at the front side of the left side of the central line O-O of the screen or the right side to the optical axis of the overhead projector of the red, whether therefore the respective red or the blue looks at the superior Premier whether it is near to that of the blue. The viewer which in case the optical axis of the overhead projector of the red is positioned at the right side about the central line O-O of a screen, is positioned in the opposite side of the central line of a screen looks at the Premier in which the red is superior on the right side of a screen.

The present invention of this irregular colour or the color shadow which the viewer of the screen front side looks tries to solve.

A second, And figure 3 shows the thing including the main body (11) (A main body can do to the acrylic resin for example) having the Fresnel lens (15) on the backplane which the rear projection screen (4) faces the overhead projector. These Fresnel lens (15) the light from the overhead projector to a parallel. It does the action of abeam orienting in the front side of the screen (4) about the side including moreover, the screen whole. In the front side of a screen, the perpendicularity drawing having the triangle section arranged as the horizontal direction as the fixed interval the conves photometric section (14), which it is done by a plumb with a suzerain that is, the shape of a mountain lens is excreted. In both sides of the conves photometric section (14), convex lenses (12,13) are excreted. As to the Fresnel lens (15), in the Fresnel lens (4a) of Figure 1, and lenses (12,13) and conves photometric section (14) correspond to the lens device (4b) of Figure 1.

Figure 3 shows the thing in which the light from the overhead projector is transformed to the beam (17a) of a perpendicularity with the Fresnel lens (15) about the side including the whole of the screen (4). The beam (17a) is incident in sides (18,19) of the conves photometric section (14) having the acute angle β.

According to the improvable point of one of the present invention, the anti-reflection layer (22) of the lacquer of the optical diffusion is coated onto each conves photometric sections (18,19). A lacquer is the same as that of the material of the screen (4) or it has the more big refraction. The thickness of the layer (22) is 2~3㎛. In a lacquer, in order that the desirable light diffusion is obtained, the wax is applied. Moreover, in the layer (22), in order that the desirable light diffusion is obtained, the calcium carbonate (CaCO3) is applied.

The result of the diffusion of the light, and the beam (17a) are divided to vector groups (20,21) of 2. It passes through the layer (22) of the side (19) and one vector group (21) is the radiation. And one vector group (20) is generated with the reflection of the side (19). Generally the vector group (21) is moreover deflected about the normal of the side (19) about the side of the side (19) to the angle of 1 a (a/4) of 4 minutes with the angle a/6. In order that it has 1 a (a/4) of 4 minutes as 15°, the apex angle β of the conves photometric section is greater than 30° according to the refractive index of the lacquer coated onto and additive of a lacquer. Preferably it does less than and, 43° to the angle of 37°. Vector groups (20,21) radiated from the screen (4) include the light ray which mutually leans. It plays the change of a colour in the range within ±10° according to that about a normal with the neutralization. This phenomenon occurs with the light diffusion function of the layer (22) which is a mixing and intersection of the light ray generated.

In Figure 4, the route of the light ray from the overhead projector of 2 of the respective (R) and blue color (B) are illustrated. As to Figure 4, the overhead projector is arranged so that the optical axis be comprised the reciprocity 16. If the layer (22) in which the light ray is coated is passed through, it is the light ray of the blue color (B) and (R) mixed.

In Figure 5, another preferred embodiment of the present invention consisting of in other words, the side (22A) in which sides (18,19) of the conves photometric section (14) are irregular of the wave is illustrated. The pitch of the wave of the side (22A) is the treble dyadic of the average Length of the maximum wavelength of the light. It has no choice but to be greater than moreover, this average Length. A this, in other words, the irregular side of the wave has a plurality of normals of the different direction about the normal of the total face of sides (18,19). Therefore, light raies (20,21) radially. It neutralizes the change of the colour of the light. The shape of the irregular surface of Figure 5 is processed and it is depicted. And it consists of a fluctuation. In fact minute.

The irregular surface of sides (18,19) can be done by the matte side. It is preferable that this matte side is cast-molded with a type is manufactured by using the artificial diamond. Using the structure of the granularity of a diamond, a type produces the irregular side like the size of the particle of a diamond. The minute irregularitie of the matte side mixes the refracted light ray as the dispersion. It evanishes the superior direction of the light ray of each colour.

A type performs the estival surface process to a method after the manufacture. In this surface process, it has the method of 2 kinds.

a: among the container including the solution of any kind of chemical substance, the oxide aluminum film of the thickness 10~20㎛ is attached in a type. After the thin matte side is produced, it seals.

b: among the container including the solution of any kind of chemical substance, a type is rusted with 10~20 second. After the aluminium oxide of 10~20㎛ is attached, it seals.

The processing method a/6, and the advantage of b are as follows.

a: the method of a type becomes with a hardening.

b: the unnecessary reflection of the light from the outside (the front of a screen) of a screen, is reduced.

As a coating, the surface process a/6, and b give the same effect.

In the screen (4), the media refracting the light can be uniformly included in one side of a screen in other words. As the pigment of the organic or the inorganic, the media does the action of removing the color shadow.

Figure the sixth expresses the respect for the aged that the light of the green passes through lenses (12,13) of a perpendicularity, and the conves photometric section (14). As shown in it is clear from this drawing, the beam G3 is not refracted. Because, in the point in which a beam goes the rear projection screen (4) to office, it is the perpendicularity sharp-edged tool because about the surface. The beam G1, G2, and G4 are refracted according to the refractive index of the material of the screen. If the radius of the curved surface of lenses (12,13) is more enlarged, the total reflection occurs in this lens surface. The route of the light in the conves photometric section (14) is the same like the above-described bar. But as shown in it is clear from Figure 6, lenses (12,13), and the conves photometric section (14) assist. The viewing angle is to about 150°.

A seventh, is an eighth, And figure 9 shows the embodiment of the rear projection screen.

[Embodiment 1]

The type having the shape showing for Figure 7 was used. The board of the PMMA (polymethylacrylate) of the thickness 3mm was cast-molded. In this polymethylmethacrylate plate, the silicon dioxide (SiO2) of a m2 the particle diameter 5~35㎛ was included rather than with 20g. The distance D/6 of the peak-to-peak of the conves photometric section (14) was done by 0.80mm. The radius of curvature R/6 of lenses (12,13) 0.30mm , and the apex angle β were done by 38°. The distance d/6 of the interval intersecting with lenses (12,13) of lens sides (18,19),s of the point was done by 0.26mm. Moreover, it did about the angle γ 1 in which the radius of lenses (12,13) in the point and the tangent line intersecting with lenses (12,13) and conves photometric section (14) were reached to 90°. After a screen was cast-molded, it coated a screen in the lacquer of the refractive index 1.50 to add the calcium carbonate (CaCO3) of the wax of 25g per the lacquer 1 liter and 15g.

The characteristic of this screen is as follows.

Peak gain: 5.6.

Lateral diffusion half-power angle (半値角): 38°.

Vertical diffusion half-power angle: 7.5o.

As the brightness of the transmission light of the direct measured at the vertical direction about a screen, the peak gain is the value compared with the standard value (MgCO3) of the wily idea.

This screen showed the good performance seeing Premier in terms of the viewing angle more than ±75°. Moreover, this screen showed the uniformity of the good colour.

[Embodiment 2]

In this preferred embodiment, the design of being the same like the room showing for Figure 8 was performed. As to lenses (12,13), a part of a circle was not whole. Whole was comprised the plane as to the place contacting each other. As to this design, particularly the angle comprised the optic axis of the projection cathoderay tube was suitable for the television of the projection mode more than 8°. The manufacturing method nearly made identical with the method illustrated in the first preferred embodiment.

The characteristic of this screen is as follows.

Peak gain: 5.8.

Horizontal half angle: 36°.

Vertical half-power angle: 8°.

In order to increase the diffusion of the light of the double-speech of the vertical direction of the rear projection screen and horizontal direction, it can give advice to add the diffusion suspicion media. As this kind of the diffusion suspicion media, it is big with 0.05~0.07 or the refractive index is the glass of the small micropowder from SiO2, CaCO3, and BaSO4 and base material for example. As the base material, the acrylic resin (A pojymethylMethacrylate) of the refractive index 1.49 can be used.

[Embodiment 3]

In Figure 9, the design of the estival specification is illustrated. It was done by the apex angle β =40°, the angle γ 1=80°, R=0.15㎜, the distance D=0.40㎜, the angle γ 2=50°, a d=0.14㎜ of the conves photometric section (14). The principal changing point about the second preferred embodiment changes the angle γ 1 from 90 into 80°. Using this change, the transmission light directly reduced within the measurement range ±8°. The peak gain was low. But the distribution of the more uniform light was obtained.

The characteristic of this screen is as follows.

Peak gain: 4.2.

Horizontal half angle: 36°.

Vertical half-power angle: 8°.

Among the embodiment of 3 theses, this screen shows the uniformity of the most good colour.

According to the present invention, the problem of color shadow generated around the viewer excreting the optical diffusion method in each side of the conves photometric section of the front side of the rear projection screen, and in that way after it consists of a parallel from the overhead projector in the photosilver emitted, and the screen backplane, when it passes through the side of the conves photometric section, is diffused, and consequently looks in the horizontal working realm of the convex lens can be resolved.

Scope of Claims

Claim 1 :

The rear projection screen wherein in the screen backplane facing the overhead projector, it has the lens group (15) the light from the overhead projector to a parallel; it is the rear projection screen having the conves photometric section (14), having the triangular form cross section which is arranged in moreover, the screen front side as the horizontal direction having an interval COMMMA of a perpendicularity and convex lenses (12,13) arranged between this conves photometric section (14); and it has optical diffusion methods (22,22A) on each sides (18,19) of the conves photometric section (14).

Claim 2 :

The rear projection screen of claim 1, wherein the optical diffusion method is made of the anti-reflection layer (22) coating the surface of sides (18,19) of the conves photometric section (14) with a lacquer.

Claim 3 :

The rear projection screen of claim 2, wherein in the layer (22), the wax and CaCO3 are mixed; and the refractive index of CaCO3 and wax is different with the refractive index of the material of a screen.

Claim 4 :

The rear projection screen in which the optical diffusion method is the surface (22A) in which sides (18,19) of the conves photometric section (14) are irregular of a shape as to claim 1.

Claim 5 :

The rear projection screen which is the matte side of the surface (22A) of the irregular shape as described above as to claim 1.

Claim 6 :

The rear projection screen of claim 1, wherein the light refractive medium is mixed within a screen.

Claim 7 :

The rear projection screen of claim 6, wherein it is uniformly dispersed in one of light refractive medium is a screen, in other words, both sides of a screens.

Claim 8 :

The rear projection screen in which the light refractive medium is the organic or the inorganic pigment as to claim 7.

Drawings

Fig. 1

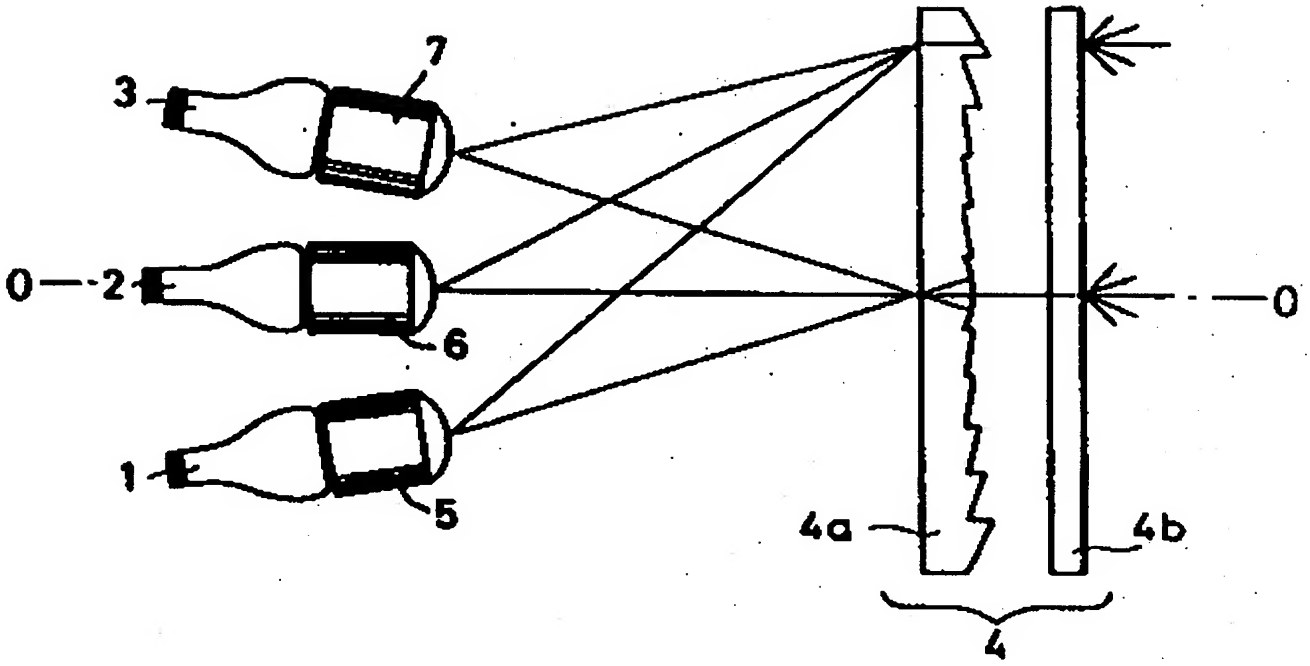


Fig. 2

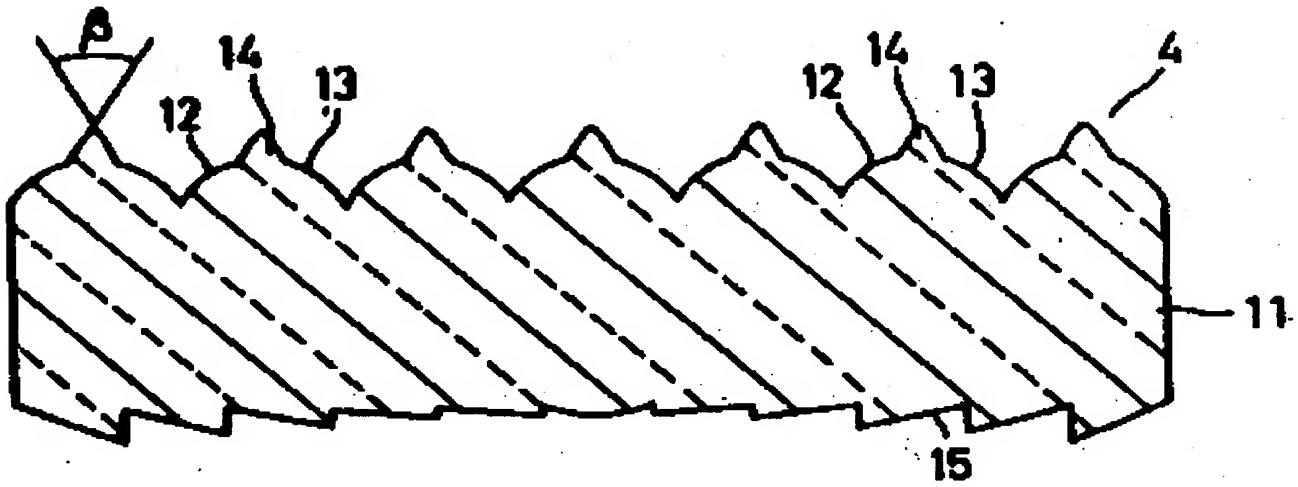


Fig. 3

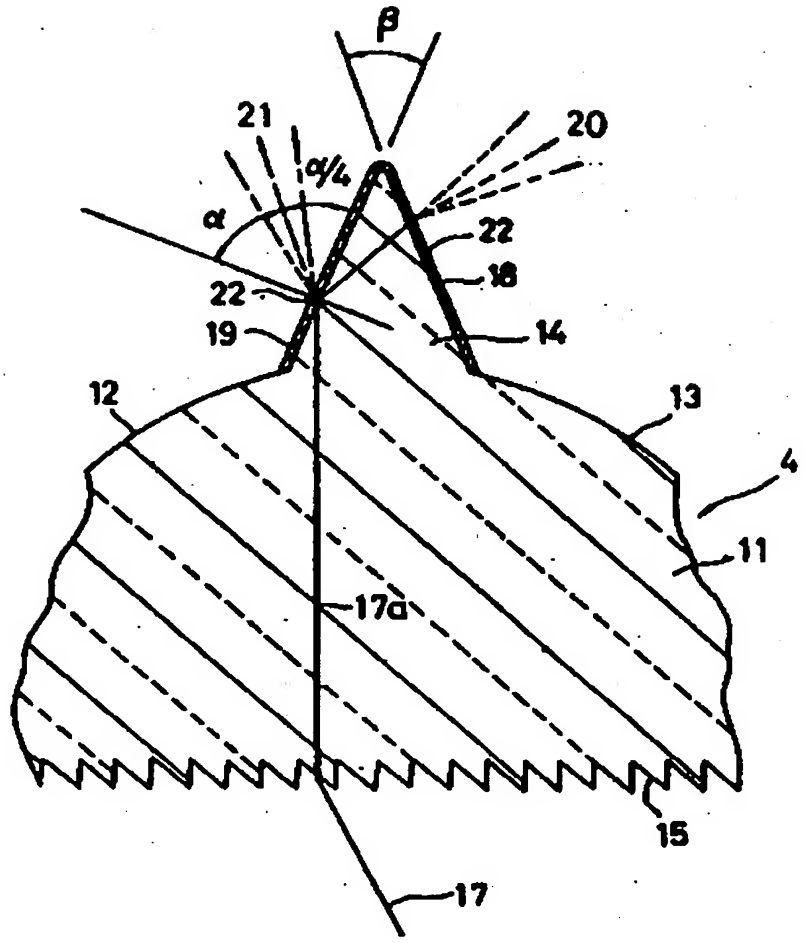


Fig. 4

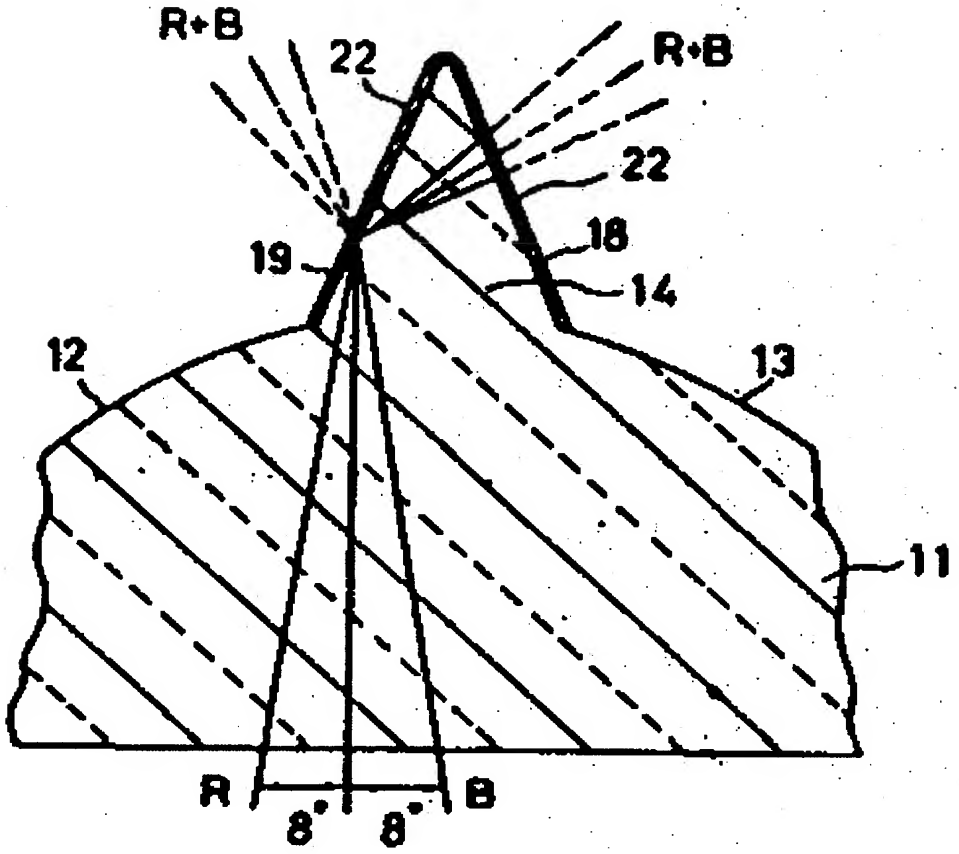


Fig. 5

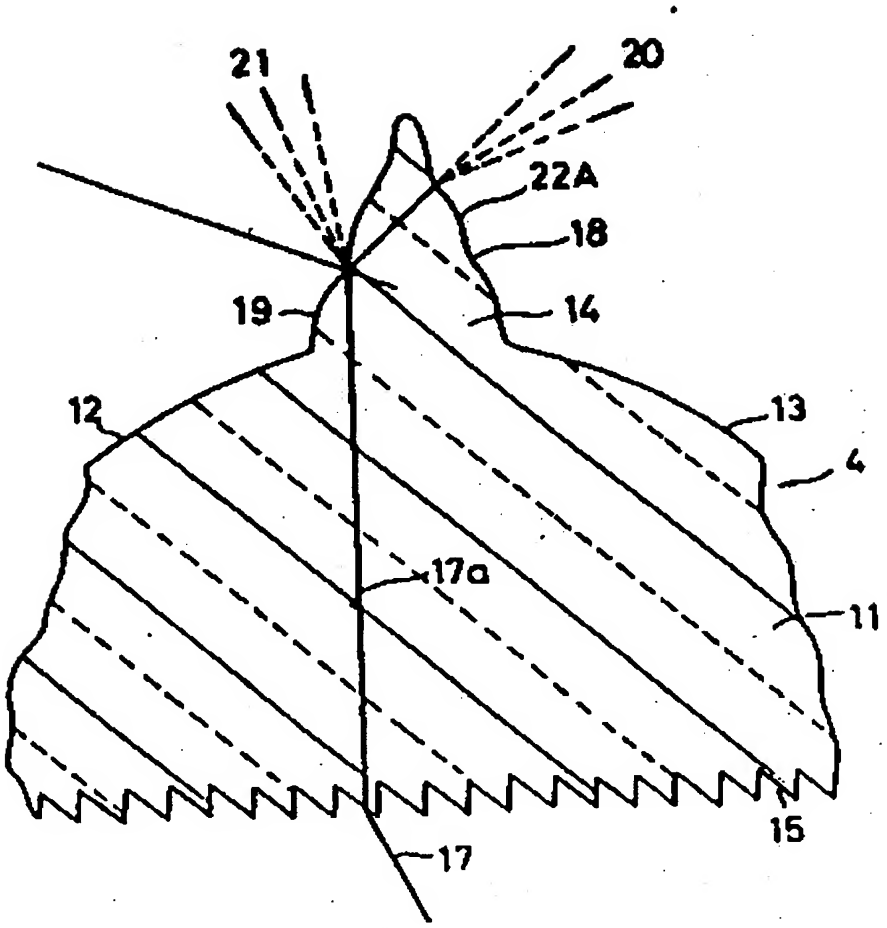


Fig. 6

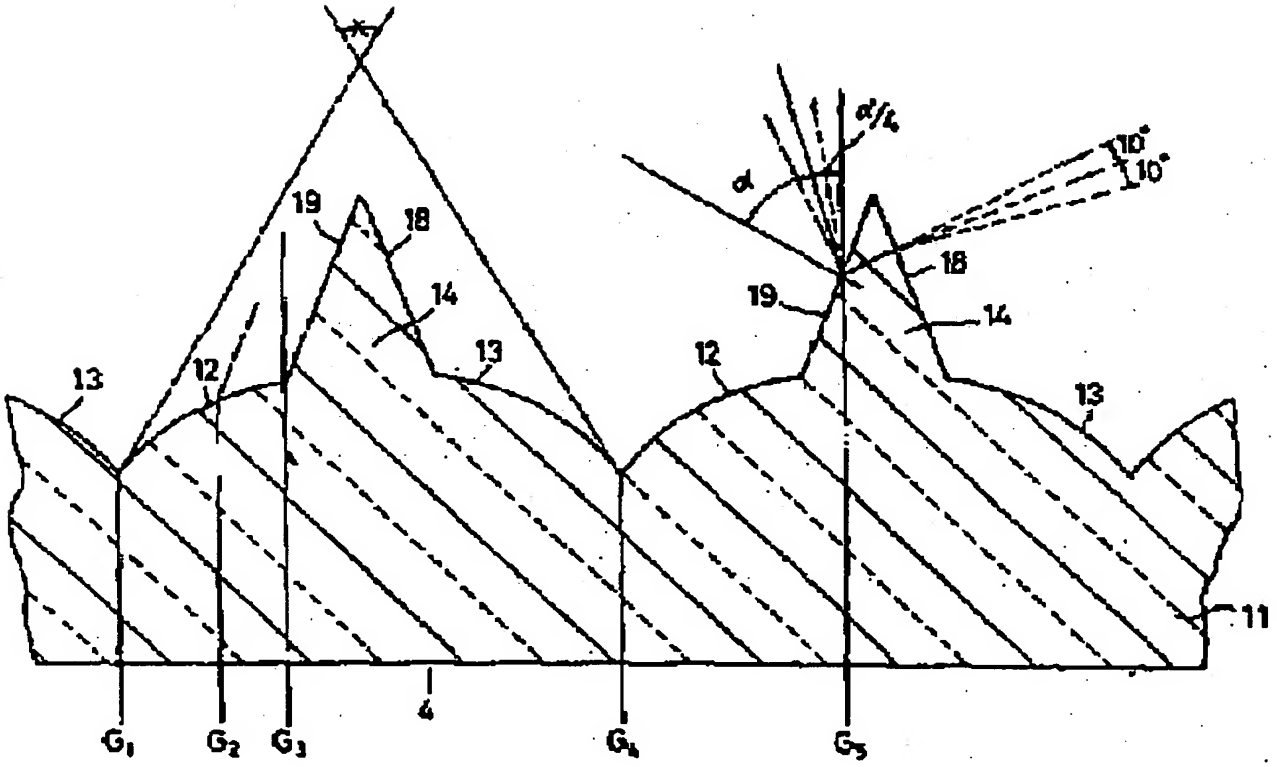


Fig. 7

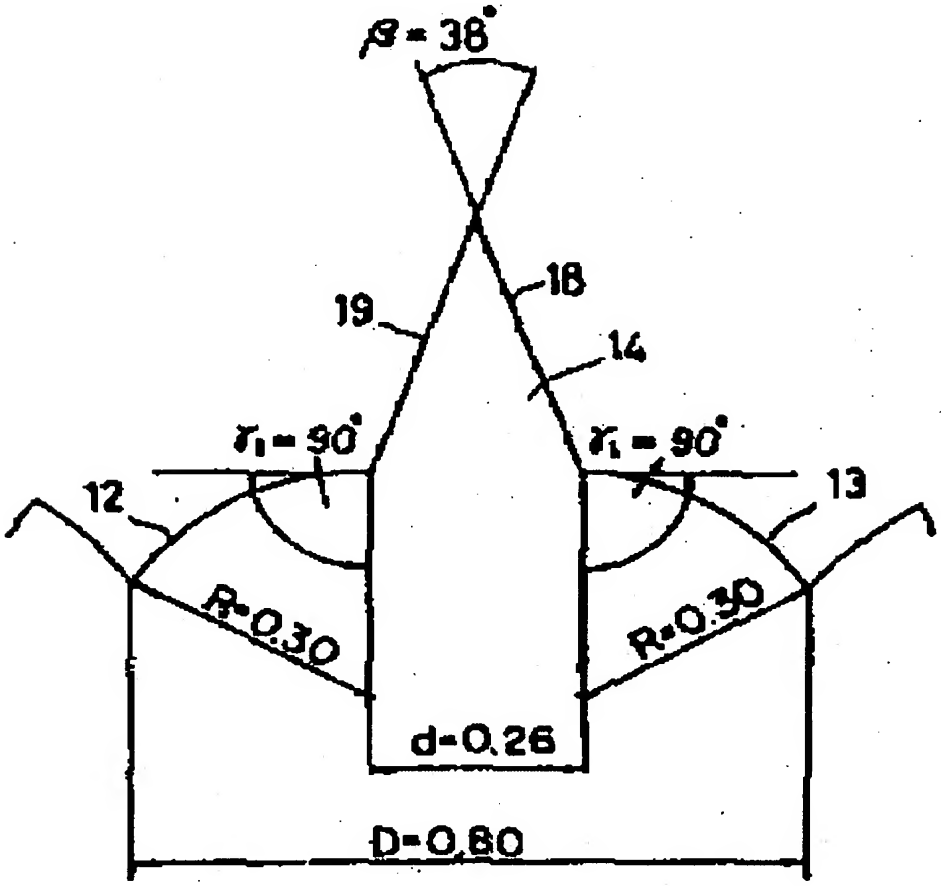


Fig. 8

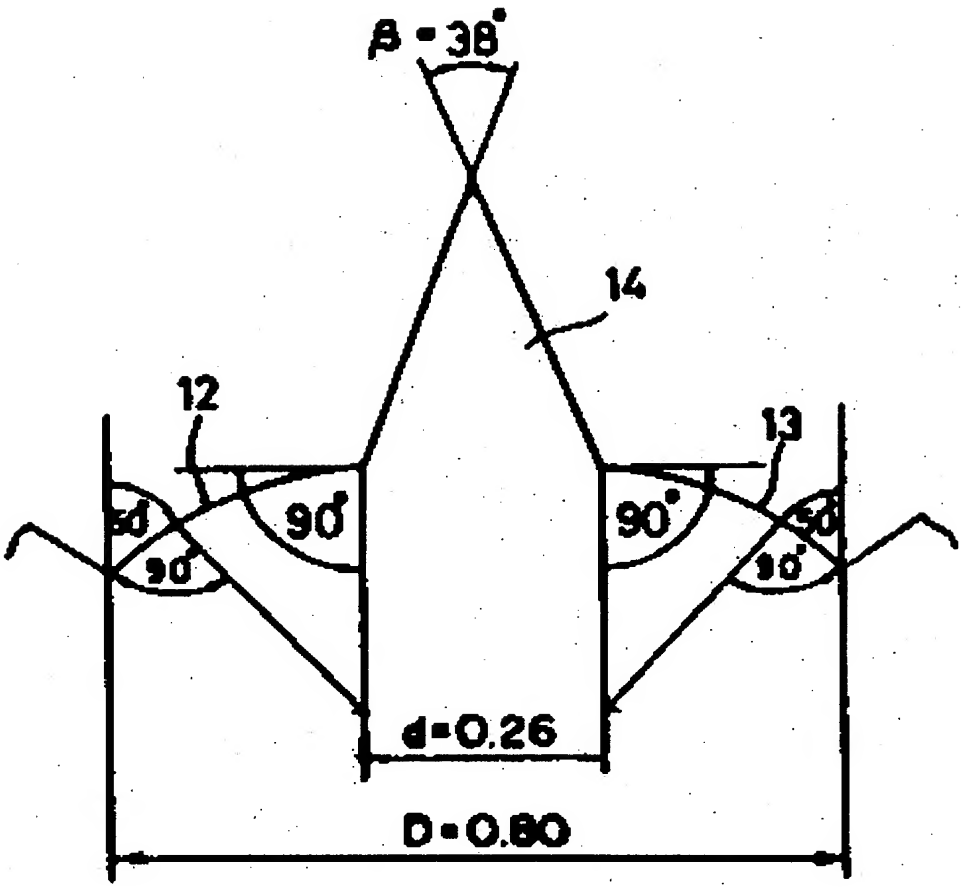
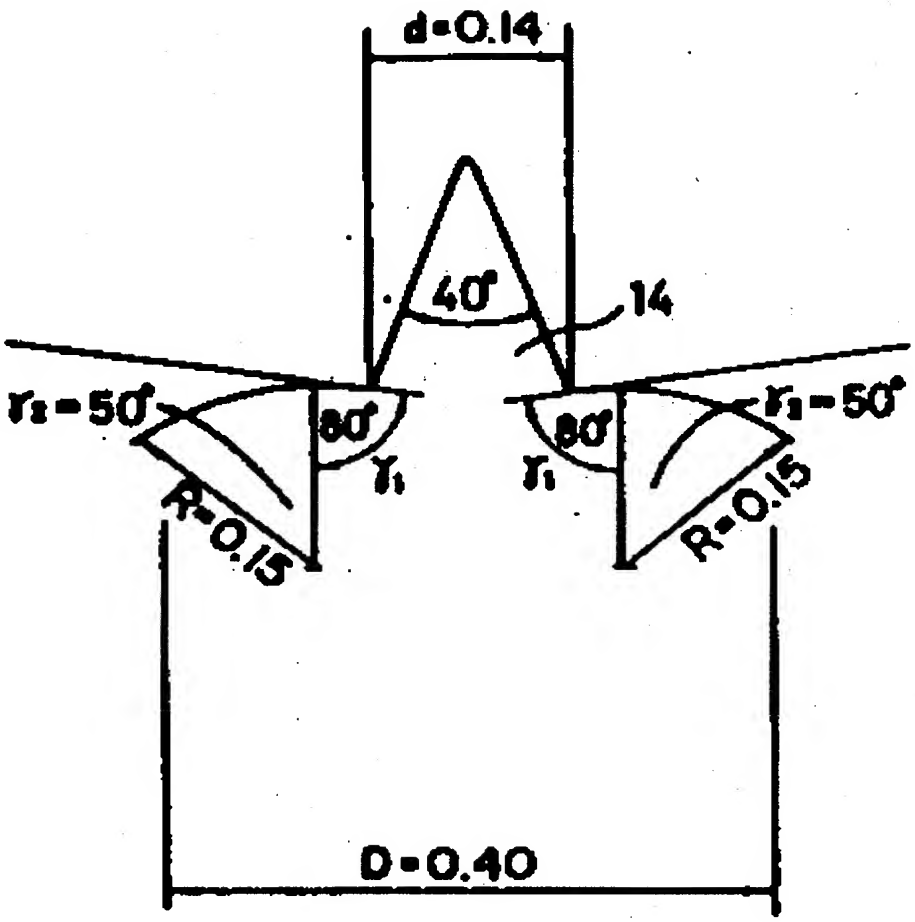


Fig. 9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40°
14
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80°
r₁
r₁
80°
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R=0.15
R=0.15
D=0.40

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박종길

심사청구 : 없음

(54) 후면투영 스크린

요약

내용 없음

대표도

도1

명세서

[발명의 명칭]

후면투영 스크린

[도면의 간단한 설명]

제1도는 세개의 투영기와 광이 이 투영기들로부터 투사되는 후면투영 스크린을 도시한 개략 평면도.

제2도는 본 발명의 후면투영 스크린의 평단면도.

제3도는 본 발명의 제1실시예를 도시한 제2도의 부분 확대도.

본 내용은 요부공개 건이므로 전문 내용을 수록하지 않았음

(57)청구의 범위

청구항1

투영기들에 대면하는 뒤쪽에는 투영기들로부터 오는 광을 평행으로 만드는 렌즈(15)가 배설되고, 그 앞쪽에는 대략 삼각형 단면의 직립돌기의 형태로 소정 간격의 렌즈(14) 및 이 돌기형상의 렌즈(14) 사이에 블록렌즈(12,13)가 배설되는 투명 후면투영 스크린에 있어서, 각 돌기형상의 렌즈(14)는 그 측면(18,19) 상에 광학산부(22,22A)를 가지는 것을 특징으로 하는 투명후면투영 스크린.

청구항2

제1항에 있어서, 상기 광학산부는 돌기형상의 렌즈(14)의 측면(18,19)의 표면에 고팅된 락카의 반반사층(半反射層)(22)인 것을 특징으로 하는 후면투영 스크린.

청구항3

제2항에 있어서, 상기 반반사층(22)은 왁스 및 $CaCO_3$로 혼합되고, 왁스 및 $CaCO_3$의 굴절률은 스크린재의 굴절율과 상이한 것을 특징으로 하는 후면투영 스크린.

청구항4

제1항에 있어서, 상기 광학산부는 측면(18,19)는 위에 형성된 불규칙면(22A)인 것을 특징으로 하는 후면투영 스크린.

청구항5

제1항에 있어서, 상기 불규칙면(22A)은 무광택면인 것을 특징으로 하는 후면투영 스크린.

청구항6

제1항에 있어서, 상기 광굴절매체는 스크린내에 혼입된 것을 특징으로 하는 후면투영 스크린.

청구항7

제6항에 있어서, 상기 광굴절매체는 스크린내에 또는 스크린의 양 측면중의 하나에 고르게 부산된 것을 특징으로 하는 후면투영 스크린.

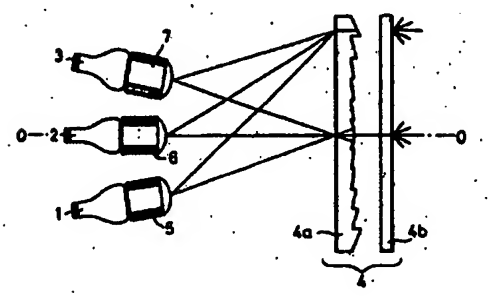
청구항8

제7항에 있어서, 상기 광굴절매체는 유기 또는 무기안료인 것을 특징으로 하는 후면투영 스크린.

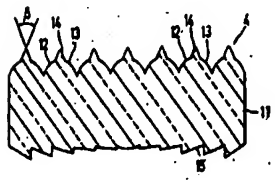
※ 참고사항 : 최초출원 내용에 의하여 공개하는 것임.

도면

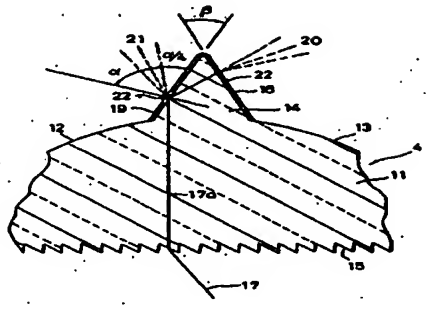
도면1



도면2



도면3


β
21
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α
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17a
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17